

THE TRANSLOCATION OF BLACK RHINO TO THE KRUGER NATIONAL PARK:

SECOND PROGRESS REPORT, DECEMBER 1982

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INTRODUCTION

The black rhino Diceros bicornis minor was re-established in the Kruger National Park in 1971 and 1972. The initial stock of 20 animals was donated by the Natal Parks Board and a further 12 came from Rhodesia (Zimbabwe). The progress of the initial introduction was reviewed by Hall-Martin (1980). Since September 1980 a further 33 black rhino from the Hluhluwe/Umfolozzi complex and 2 (ex-Natal) from the Addo Elephant National Park were moved to the KNP. The 1980 introduction of 8 animals was sponsored by the Endangered Wildlife Trust. Monitoring of the black rhino population started in 1979 when a research project was registered. The work to date has consisted primarily of collating records of sightings of black rhino, an annual helicopter census of the population in the Nwaswitshaka area (between Skukuza and Pretoriuskop where the first two batches of animals were released) and a radio tracking study of four animals. This latter study was also sponsored by EWT. The purpose of this report is to review progress to date with particular emphasis on population composition and reproduction of the species in the KNP.

RELEASE AREAS

All black rhino introduced up to September 1980 (Table 1) were released from bomas near Skukuza or along the Nwaswitshaka Valley at Nwaswitshaka windmill or Manyahule windmill. A fairly dense population (up to 0,19 per km²) has become established in the area west of Skukuza as far as Matupa and centred on the Nwaswitshaka valley (Fig. 1). Dispersing subadults from this population had by the end of 1980 moved as far to the east as Randspruit, a distance of about 45 km. This dispersal away from the Nwaswitshaka area was taken as an indication that optimum density had been reached. The introductions of 1980 (Table 1) were, therefore, taken to Marabou Pan along the Lubyelubye Spruit near Lower Sabie (Fig. 1). As five of the eight animals released at Marabou Pan were males, a further six animals (2M, 4F) were released there in 1981.

The third release area to be used was at Kumana along the Nwaswitsontso River and a few kilometres further north along the Sweni River. This area is about 20 km south of Satara in the Central District of the KNP (Fig. 1).

DISTRIBUTION OF BLACK RHINO

The distribution of black rhino in the KNP is shown in Fig. 1. The changes in the distribution of these animals now and in 1980 (Hall-Martin 1980) is due to the release of animals at Marabou Pan and at Kumana/Sweni.

The black rhino were all moved to the KNP direct from the field in the Natal reserves. Many originally dispersed far from the release sites. In several cases animals released in the late afternoon were as much as 20 km away by the following morning. However, most of these wanderers appear to have moved back towards the release areas or to areas of ideal

TABLE 1: Sex and age composition of black rhino introduced to Kruger National Park 1971-1982.

Date	Locality	Origin	Adult		Immature		Total
			Male	Female	Male	Female	
1971	Nwaswitshaka/Skukuza	A	9	9	1	1	20
1972 Oct	Nwaswitshaka/Skukuza	B	4	6	2	0	12
1977 Sept	Nwaswitshaka	A	0	2	0	0	2
1979.10.12	Nwaswitshaka	C	0	1	0	0	1
1980.10.14	Lubyelubye	A	3	1	0	0	4
1980.11.18	Lubyelubye	A	2	2	0	0	4
1981.05.15	Kumana	D	2	0	0	0	2
1981.07.04	Kumana	A	2	1	0	1	4
1981.08.12	Lubyelubye	A	2	2	0	0	4
1981.09.07	Sweni	A	1	1	1	0	3
1981.09.07	Lubyelubye	A	0	2	0	0	2
1981.10.03	Sweni	A	1	1	1	0	3
1981 Oct.	Kumana	A	4	2	0	0	6
1982.07.14	Kumana	A	3	0	0	0	3
			33	30	5	2	70

Origin

A = Hluhluwe/Umfolozi Complex, Natal

B = Zambezi Valley, Rhodesia (now Zimbabwe)

C = Stray from Gona-re-Zhou, (also ex-Zambezi Valley) caught near Shingwedzi

D = Addo Elephant National Park (ex Natal, September 1977)

habitat where other black rhino also settled. The Sweni population is now settled and there is no contact yet between these black rhino and those in the south. Several of the animals released along the Sweni (west of the Tshokwane - Satara road) and near Kumana moved eastwards to the area around Guweni Dam just to the south of Nwanedzi. They appear to have settled in an area of predominantly Acacia/Maroela savanna. At least three animals; a bull, a cow and subadult, from the Lubyelubye area have crossed the Sabie River and are now settled along the Lebombo foothills, to the north east of Lower Sabie.

MORTALITY AND LOSSES

The deaths of five introduced black rhino between 1971 and 1977 were detailed in the previous report. Since then three more black rhino deaths have been reported.

- a) One of the adult bulls from Addo was in distress when it arrived and was found dead on 1981.05.16.
- b) A subadult female, about 2 years old whose remains were found near Pretoriuskop in 1981. This animal was born in the KNP.
- c) The carcass of a known old male was discovered along the Nwaswitshaka River in June 1982.
- d) One adult bull broke through the western boundary fence in 1972 and took up residence in the Sabi Sand Reserve. Several unsuccessful attempts were made to capture this animal and return it to the KNP.

INJURIES

Over the past two years two reports of injured black rhinoceros were received. Follow-up action was immediately taken because of the great value attached to these animals in the KNP.

- a) On 2 March 1982 a report was received of a black rhino, with a snare on a front leg, drinking at Lower Sabie. A research officer and veterinarian were immediately despatched by helicopter from Skukuza and the animal was located and immobilised. Examination showed that the injury, which had healed up, was an old one and had been caused by a snare while the animal was still in Natal. The clinical history was later confirmed by the veterinary officer of the Natal Parks Board, Dr. J. Flamand who had examined the animal before it was despatched to Kruger.

- b) On 18 November 1982 a report was received of a black rhino with an injured, bleeding leg near the Skukuza Storage Dam. The next morning a team went out by helicopter and searched the area thoroughly for 2 hours. No injured black rhino was found and there have been no further reports. However a cow with a very small calf was found. This cow was seen during the helicopter census of 13 September when she was still accompanied by a 2,5 year old male calf. We surmise that she violently chased away this male calf at about the time of the birth of the new calf (as is commonly done by black rhino - vide Hall-Martin and Penzhorn, 1977). This young male was seen again on 4th January 1983 in apparently good health.

SEX RATIO

Of the total of 70 black rhino introduced to the KNP from 1971 to 1982 38 were males and 32 were females. Known mortalities of introduced animals accounted for five males and two females. The sex ratio at present must approximate:

	<u>M</u>	<u>F</u>
Introductions	33	30
Known sex calves born in KNP..	6	5
	<u>39</u>	<u>35</u>

The sex of the other calves born in the Park are not known with certainty. However, despite the slight preponderance of males in the 39:35 ratio a χ^2 test showed that the difference was not statistically significant. The overall sex ratio in the population is therefore likely to be close to 1:1. However, the sex ratios of the three sub-populations differ. The reasons are that the sex composition of the individual loads of rhino were not always in equal proportions and the consignments of 1980 (5 male, 3 female); 1981 (12 male, 10 female) and 1982 (3 males only) were all predominantly male animals. Furthermore the single surviving animal translocated from Addo was also a bull. The composition of the Sweni population is therefore in excess of 2 bulls to every cow:

Sweni: 14 Male, 6 Female

Because of the small sample size a χ^2 test showed this not to be a significant departure from 1:1 at the .05 level of probability, it is however significant at a level of 0.10 ($\chi^2 = 3.2$).

The sex ratio of the animals released in the Lubyelubye area is 1:1

Lubylubye: 7 Male, 7 Female

However, most of the animals dispersing from the Nwaswitshaka area have been found to be young bulls. Of these three have established themselves on the periphery of the Lubyelubye population (Ayinagamu, Randspruit beacon, Sardelli). The overall sex ratio of the Lubyelubye area is thus 10 males:7 females which is, however, not statistically significant.

Despite the statistical picture which emerges from the above there is obviously still a good case to be made for boosting the female segment of the Sweni sub-population. This is especially so in view of the excellent reproductive rate achieved by the black rhino in the KNP (see below).

REPRODUCTION

Status of the KNP population

The data yielded from the helicopter and fixed wing surveys indicate that reproduction in the Nwaswitshaka black rhino population is

extremely good. The sex and age composition of the black rhino population is given in Table 2 for the results of the helicopter surveys, and in Table 3 the fixed wing and helicopter data have been combined to create a larger sample for the three years 1980 - 1982. This latter step may mean that some animals have been included twice in the figures, provided this did not often occur it should not change the percentage of animals in each category significantly. Comparisons were made of the mapped localities of animals, and sex and age composition, to avoid duplication wherever possible.

TABLE 2: Sex and age composition of black rhino counted during helicopter surveys, Skukuza/Nwaswitshaka area 1979-1982.

Year	Total	Adult		Immature									% Immature	% Juvenile	Immature per Adult F	Mean group size		
				Subadult 2-3,5y			1-2y			Juvenile 0-1y						N gp	\bar{X}	
				M	F	?	M	F	?	M	F	?						
1979	18	1	9	0	1	0	0	1	0	2	1	0	3	44,4	22,2	0,88	10	1,8
1980	19	5	7	2	1	0	0	1	0	2	1	0	0	36,8	15,8	1,00	12	1,6
1981	17	5	6	1	1	1	2	1	0	0	0	0	0	35,3	0	1,00	10	1,7
1982	14	3	5	0	3	0	3	0	0	0	0	0	0	42,8	0	1,20	8	1,7

TABLE 3: Sex and age composition of black rhino counted during helicopter and fixed-wing aircraft surveys (data combined) Skukuza/Nwaswitsaka area 1980-1982.

Year	Total	Adult			Immature									% Immature	% Juvenile	Immature per Adult F	Mean group size	
					Subadult 2-3,5 y			1-2y			Juvenile 0-1y						N gp	\bar{X}
					M	F	?	M	F	?	M	F	?					
1980	30	6	11	0	2	1	2	0	1	3	2	1	1	43,3	13,3	1,18	17	1,8
1981	26	6	8	5	1	0	2	2	0	1	0	0	1	26,9	3,8	0,87	16	1,6
1982	31	6	11	1	0	3	2	3	1	1	0	1	2	41,9	9,7	1,09	18	1,7

In none of the subsamples is the immature animal component less than 26,9% and the mean value for the seven subsamples is 38.7%. The mean group size of the combined observations is 1,7 which indicates a high incidence of cow/calf groups. A further index of reproductive rate is the proportion of immature animals to adult females which varies from 0.87 to 1.18 and the mean for the seven subsamples is 1.03. Because this index is independant of the number of bulls seen (which influences the % immature figures) it is a more accurate reflection of the breeding rate within the population.

The percent juveniles (less than one year old) for the seven subsamples is 9,2, while that for the three larger subsamples of Table 3 alone, is 8,9. These figures indicate a calving rate of about 9% per annum.

All these data taken together indicate very clearly that there is a high reproductive rate in the introduced black rhino population, and that it is obviously a "young" and expanding population.

Comparison with the population of the Central Complex of Zululand

In a report on the population composition of the black rhinoceros in the Hluhluwe/Umfolozi Complex (Brooks, Whateley and Anderson 1980) data are given against which the situation in the KNP can be measured. The data may not be strictly comparable because of the smaller samples from the KNP, however for present purposes a comparison is most informative. Table 4 gives the proportions of immature black rhino in different areas of the Complex in different years. The percent immature animals (younger than 3,5 years) in the entire complex in 1972, 1976 and 1980 was 21,6; 17,5 and 16,4 respectively. It can be seen that these

figures are all considerably lower than the range of 26,9 - 44,4% found in the KNP. The proportion of immature animals to adult females in the Zululand data in 1980 have been calculated from the data of Brooks, Whateley and Anderson (1980) and are as follows:

Hluhluwe Game Reserve ...	0.27
N. Corridor	0.44
S. Corridor	0.69
Umfolozzi Game Reserve ...	0.15

The highest of these figures (0.44 for N. Corridor) is only half as good as the lowest for the KNP (0.87 in 1979). If it is assumed that 10% of the females classified as adult in the KNP are too young to have bred (3,5 - 6,5 years old) the differences between the two populations are then even greater.

The mean group size of black rhino in the KNP of 1,7 is higher than the mean of 1.55 for the Zululand reserves. The calving rate (% of animals less than one year) was 4,7% in the Complex in 1980 as compared with 9,0% in the KNP.

Calving intervals in KNP

From the records of known cows, some of which have now been seen on four occasions during the helicopter surveys, a rough estimate of calving intervals is possible. The ages of calves are estimated in the field and from photographs using the criteria of Hitchins (1970).

Three calving intervals of about 30, 31 and 36 months have been recorded to give a mean calving interval of 32 months. This compares well with 35 months for black rhino in the Addo Elephant National Park (Hall-Martin and Penzhorn 1977); but is slightly longer than the 27 months suggested by Goddard (1967) and by Joubert & Eloff (1971).

TABLE 4: Proportions of immature black rhinos in selected areas of the Hluhluwe/Umfolozzi Complex in 1972, 1976 and 1980. (Taken from Brooks, Whateley and Anderson 1980).

RESERVE	YEAR	% IMMATURE
H.G.R. & N. Corridor	1972	18,1 %
	1976	14,6 %
	1980	13,5 %
S. Corridor	1972	26,1 %
	1976	21,8 %
	1980	31,0 %
U.G.R.	1972	28,3 %
	1976	17,6 %
	1980	8,0 %
Complex	1972	21,6 %
	1976	17,5 %
	1980	16,4 %

ESTIMATE OF POPULATION SIZE

From the data given in Table 3 a mean calving percentage of 8,9% can be calculated (percentage of animals less than one year old). Applying this calving rate to the total population for each year from 1972 onwards, (number of introduced animals, less known mortalities, plus calves), we can construct a very rough picture of the theoretical increase in the black rhino population in the KNP (Table 5). Such an exercise has many inherent weaknesses, one of which is our lack of complete data on natural mortality. However it is better than guesswork and of the 35 predicted calves, at least 21 have actually been seen during aerial surveys or reported by ground patrols. Our estimate of 96 animals (Table 5) is therefore not likely to be too far from reality.

DENSITY

The sector of Nwaswitshaka Valley, which has been surveyed by helicopter four times, covers about 135 km². The number of black rhino counted in each survey (Table 2) can be used to calculate an absolute minimum crude population density of 0.10 - 0.14 black rhino per km². However, as the four surveys (during which every animal was photographed) showed that a minimum of 26 different animals occupied the area, we can increase the density estimate to 0.19 black rhino per km² (it may be less as the figure of 26 animals includes subadults which may have dispersed from the area).

TABLE 5: Theoretical increase in the KNP black rhino population based on an annual increase of 8,9%

Year	Introductions (Table 1)	Mortality or loss	+ 8,9% calves	Total at year end
1971	20	1	-	19
1972	12	2	1*	30
1973	0	2	2	30
1974	0	0	2	32
1975	0	0	2	34
1976	0	0	3	37
1977	2	1	3**	41
1978	0	0	3	44
1979	1	0	3	48
1980	8	0	4***	60
1981	24	2	5****	87
1982	3	1	7	96
TOTALS	70	9	35	

* Calving rate for 19 animals, as introductions only arrived in October 1972.

** Calving rate for 37 animals as introductions only arrived in September 1977.

*** Calving rate for 48 animals as introductions arrived in October and November 1980.

**** Calving rate for 60 animals as most introductions arrived from September onwards.

CONCLUSIONS

Black rhino are clearly well established in the Kruger National Park and their reproductive rate is good. Comparisons of several reproductive parameters (% immature animals, % calves less than 1 year, calves per

adult female, mean group size) of the KNP population with that of the Central Complex in Zululand show that the KNP animals are breeding at a much better rate than their parent population. Calving rate is about 9,0% per annum and the KNP population stands at about 96 animals. The implications of these conclusions are that if the ideal of maximising black rhino reproduction in South Africa is to be aimed at, then more animals should be moved from the high density, slowly reproducing Zululand population (which is at its ecological carrying capacity) to the KNP or other suitable areas (where black rhino are below carrying capacity). A better sex ratio in the Sweni population is also desirable.

The potential of the available habitat within the KNP has hardly been touched. The conservative carrying capacity of 3529 black rhino calculated in 1980 for the KNP is far from being approached at this stage.

The value of the KNP as a rhino sanctuary is once again shown clearly by the estimates of black rhino (96) and the 1982 count of white rhino (738). These figures comprise 15,4% and 29,5% of the total rhino populations of South Africa and Bophuthatswana combined.

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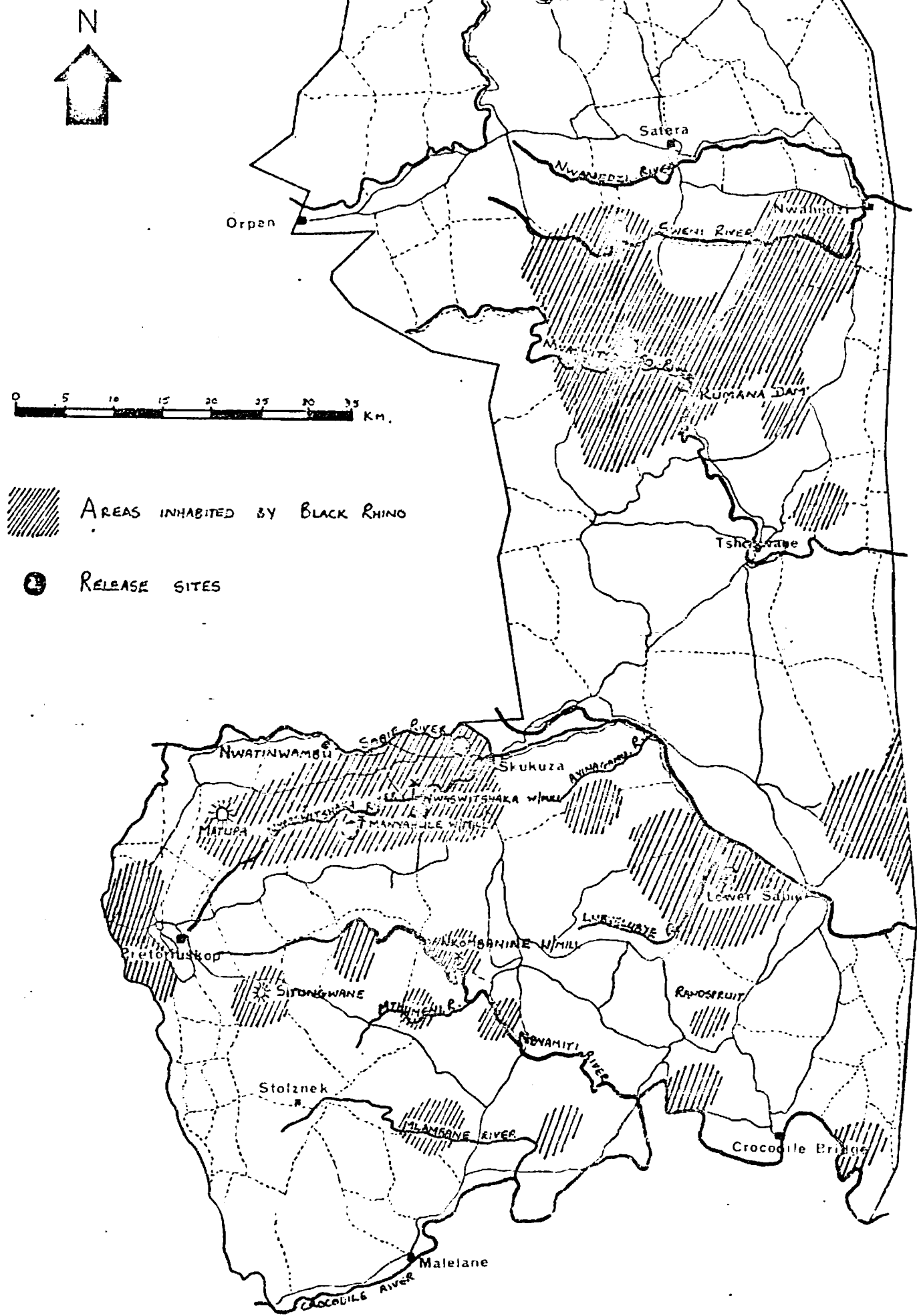


Fig. 1 Southern and Central Districts of the Kruger National Park showing release sites and areas subsequently occupied by black rhino.